SECTION 1
INTRODUCTION

The Central & Southern Florida (C&SF) Project extends from south of Orlando to the Florida Keys and is composed of a regional network of canals, levees, storage areas and water control structures. First authorized by Congress in 1948, the project serves multipal purposes. The authorized purposes of the project include flood control, regional water supply for agricultural and urban areas, prevention of salt water intrusion, water supply to Everglades National Park, preservation of fish and wildlife, recreation and navigation. For close to 50 years, the C&SF Project has performed its authorized functions well. However, the project also has had unintended adverse effects on the unique natural environment that constitutes the Everglades and south Florida ecosystem.

In the late 1800s and early 1900s, the principal impediment to development in south Florida was flooding. Flood control works were necessary to realize the economic potential of the state's exceptional natural resources. As a result, major drainage projects were initiated first by the State of Florida and then later in partnership with the federal government, through the Corps of Engineers. This partnership worked to control the hydrologic conditions that were hampering economic development. The emphasis on economic goals clearly focused the design of the C&SF Project towards development of the region with little understanding of or concern for the consequences to the Everglades ecosystem.

To meet project objectives, the C&SF Project impacted a significant portion of the natural system. The Kissimmee River was channelized. Lake Okeechobee was diked to prevent uncontrolled overflows from the lake. The region of the Everglades immediately south of Lake Okeechobee, now called the Everglades Agricultural Area, was drained and ground water levels were managed to reduce flood damages to agricultural production. A drainage system was constructed in the lower east coast to allow for urban, suburban and agricultural development. Central portions of the Everglades were diked to create the Water Conservation Areas, serving the dual purposes of storing water for human needs in the lower east coast and for deliveries to Everglades National Park. While some fish and wildlife value was expected to remain in the Water Conservation Areas, the only area intended for preservation in its natural state was Everglades National Park.

Land use and water management practices over the past 100 years in south Florida have resulted in either the loss or extensive alteration of the defining characteristics of the pre-drainage ecosystem. Loss of spatial extent of natural areas has been most severe in the past 50 years with the construction of the C&SF Project as nearly half of the original Everglades ecosystem has been converted to

agricultural and urban uses. The ecological effects of this loss in spatial extent include:

- a substantial reduction in habitat options for wildlife,
- reduction in the system-wide levels of primary and secondary production, and
- changes in the proportions of community types within the remaining system.

The hydrology of the remaining Everglades has also been substantially altered by the operation of the C&SF Project, which has reduced average annual flows and surface water stages and lowered regional ground water in the natural system. Depending on location, annual hydroperiods have either increased or decreased, geographically relocating long- and short-hydroperiod wetlands. Additionally, average salinity levels in estuaries have been raised.

Overall, the construction and operation of the C&SF Project and its subsequent modification of the natural system have:

- contributed to the substantial reduction in spatial extent and system resiliency,
- provided a network of canals and levees that have accelerated the spread of polluted water and exotic species,
- greatly reduced the water storage capacity within the remaining natural system, and
- created an unnatural mosaic of impounded and over-drained marshes throughout the natural system.

The lack of storage in the system, particularly during wet periods, has led to ecological damage of Lake Okeechobee's littoral zone and damaging regulatory releases to the St. Lucie and Caloosahatchee estuaries. Conversely, in dry periods, this lack of storage has led to water supply shortages for both the human and natural environment. The Governor's Commission for a Sustainable South Florida in its October 1995 *Initial Report* (GCSSF, 1995) stated that *"South Florida is not sustainable on its present course."*

Sustainability, according to the Governor's Commission, requires a balance between the resource requirements of the environment, the economy, and society, which are interdependent. Society is dependent upon the natural system for public health, safety, and welfare as well as an enhanced quality of life. Economic vitality is dependent upon a healthy ecosystem. A self-sustaining natural system is largely dependent upon the wisdom and actions of its human inhabitants. Actions taken by society today should not deplete the resources needed for tomorrow. The ability to restore the health of the remaining Everglades ecosystem and achieve

sustainability in water resources for all needs depends on the ability to protect and manage the resource successfully.

Protection and enhancement of the water resources in south Florida is one step towards moving the region in the direction of sustainability. The C&SF Project is the predominant feature that affects this resource. Accordingly, the C&SF Project Comprehensive Review Study, better known as the Restudy, has looked at the existing project, its physical features and operations, with a view towards recommending structural and/or operational changes to better meet the goals of south Florida ecosystem restoration and the continued provision of safe, reliable water supply and flood protection for the people who live there. Ensuring sustainable water resources for the future, or "getting the water right," – the right quantity, quality, timing, and distribution – is what the Restudy is about.

This section describes the study's authority, purpose and scope, and organization of the report; discusses compliance with the National Environmental Policy Act; and provides a brief overview of the study area and a list of prior studies and reports.

1.1 STUDY AUTHORITY

The C&SF Project Comprehensive Review Study, known as the Restudy, is authorized by Section 309(1) of the Water Resources Development Act of 1992 (Public Law 102-580) which states:

> *"(1) CENTRAL AND SOUTHERN FLORIDA. -- The Chief of Engineers shall review the report of the Chief of Engineers on central and southern Florida, published as House Document 643; 80th Congress, 2nd Session, and other pertinent reports, with a view to determining whether modifications to the existing project are advisable at the present time due to significantly changed physical, biological, demographic, or economic conditions, with particular reference to modifying the project or its operation for improving the quality of the environment, improving protection of the aquifer, and improving the integrity, capability, and conservation of urban water supplies affected by the project or its operation."*

This study is also authorized by two resolutions of the Committee on Transportation and Infrastructure, United States House of Representatives, dated September 24, 1992. The first resolution states:

> *"Resolved by the Committee on Public Works and Transportation of the United States House of Representatives, That the Board of Engineers for Rivers and Harbors, is requested to review the report of the Chief of Engineers on Central and Southern Florida, published as House Document 643, Eightieth Congress, Second Session, and other pertinent reports, to determine whether modifications of the recommendations*

contained therein are advisable at the present time, in the interest of environmental quality, water supply and other purposes."

The second resolution states:

"Resolved by the Committee on Public Works and Transportation of the United States House of Representatives, That the Board of Engineers for Rivers and Harbors, is requested to review the report of the Chief of Engineers on Central and Southern Florida, published as House Document 643, Eightieth Congress, Second Session, and other pertinent reports, to determine whether modifications of the recommendations contained therein are advisable at the present time, in the interest of environmental quality, water supply and other purposes for Florida Bay, including a comprehensive, coordinated ecosystem study with hydrodynamic modeling of Florida Bay and its connections to the Everglades, the Gulf of Mexico, and the Florida Keys Coral Reef ecosystem."

The Water Resources Development Act of 1996 was enacted on October 12, 1996. Section 528 of the Act (Public Law 104-303) entitled "Everglades and South Florida Ecosystem Restoration" authorizes a number of ecosystem restoration activities and also provides specific direction and guidance for the Restudy. The provisions of Section 528 concerning the Restudy are:

"(b) RESTORATION ACTIVITIES-
(1) COMPREHENSIVE PLAN-
(A) DEVELOPMENT-
(i) PURPOSE- The Secretary shall develop, as expeditiously as practicable, a proposed Comprehensive Plan for the purpose of restoring, preserving, and protecting the South Florida ecosystem. The Comprehensive Plan shall provide for the protection of water quality in, and the reduction of the loss of fresh water from, the Everglades. The Comprehensive Plan shall include such features as are necessary to provide for the water-related needs of the region, including flood control, the enhancement of water supplies, and other objectives served by the Central and Southern Florida Project.
(ii) CONSIDERATIONS- The Comprehensive Plan shall--
(I) be developed by the Secretary in cooperation with the non-Federal project sponsor and in consultation with the Task Force; and
(II) consider the conceptual framework specified in the report entitled "Conceptual Plan for the Central and Southern Florida Project Restudy", published by the Commission and approved by the Governor.
(B) SUBMISSION- Not later than July 1, 1999, the secretary shall--
(i) complete the feasibility phase of the Central and Southern Florida Project comprehensive review study as authorized by section 309(l) of the Water Resources Development Act of 1992 (106 Stat. 4844), and by 2 resolutions of the Committee on Public Works and Transportation of the House of Representatives, dated September 24, 1992; and
(ii) submit to Congress the plan developed under subparagraph (A)(i) consisting of a feasibility report and a programmatic environmental impact statement covering the proposed Federal action set forth in the plan.

(C) ADDITIONAL STUDIES AND ANALYSES- Notwithstanding the completion of the feasibility report under subparagraph (B), the Secretary shall continue to conduct such studies and analyses as are necessary, consistent with subparagraph (A)(i).

(2) USE OF EXISTING AUTHORITY FOR UNCONSTRUCTED PROJECT FEATURES- The Secretary shall design and construct any features of the Central and Southern Florida Project that are authorized on the date of the enactment of this Act or that may be implemented in accordance with the Secretary's authority to modify an authorized project, including features authorized under sections 315 and 316, with funds that are otherwise available, if the Secretary determines that the design and construction--

(A) will accelerate the restoration, preservation, and protection of the South Florida ecosystem;

(B) will be generally consistent with the conceptual framework described in paragraph (1)(A)(ii)(II); and

(C) will be compatible with the overall authorized purposes of the Central and Southern Florida Project.

(3) CRITICAL RESTORATION PROJECTS-

(A) IN GENERAL- In addition to the activities described in paragraphs (1) and (2), if the Secretary, in cooperation with the non-Federal project sponsor and the Task Force, determines that a restoration project for the South Florida ecosystem will produce independent, immediate, and substantial restoration, preservation, and protection benefits, and will be generally consistent with the conceptual framework described in paragraph (1)(A)(ii)(II), the Secretary shall proceed expeditiously with the implementation of the restoration project.

(B) INITIATION OF PROJECTS- After September 30, 1999, no new projects may be initiated under subparagraph (A).

(C) AUTHORIZATION OF APPROPRIATIONS-

(i) IN GENERAL- There is authorized to be appropriated to the Department of the Army to pay the Federal share of the cost of carrying out projects under subparagraph (A) $75,000,000 for the period consisting of fiscal years 1997 through 1999.

(ii) FEDERAL SHARE- The Federal share of the cost of carrying out any 1 project under subparagraph (A) shall be not more than $25,000,000.

(4) GENERAL PROVISIONS-

(A) WATER QUALITY- In carrying out activities described in this subsection and sections 315 and 316, the Secretary--

(i) shall take into account the protection of water quality by considering applicable State water quality standards; and

(ii) may include in projects such features as are necessary to provide water to restore, preserve, and protect the South Florida ecosystem.

(B) COMPLIANCE WITH APPLICABLE LAW- In carrying out the activities described in this subsection and subsection (c), the Secretary shall comply with any applicable Federal law, including the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) and the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.).

(C) PUBLIC PARTICIPATION- In developing the Comprehensive Plan under paragraph (1) and carrying out the activities described in this subsection and

subsection (c), the Secretary shall provide for public review and comment on the activities in accordance with applicable Federal law.

(c) INTEGRATION OF OTHER ACTIVITIES-

(1) IN GENERAL- In carrying out activities described in subsection (b), the Secretary shall integrate such activities with ongoing Federal and State projects and activities, including--

(A) the project for the ecosystem restoration of the Kissimmee River, Florida, authorized by section 101 of the Water Resources Development Act of 1992 (106 Stat. 4802);

(B) the project for modifications to improve water deliveries into Everglades National Park authorized by section 104 of the Everglades National Park Protection and Expansion Act of 1989 (16 U.S.C. 410r-8);

(C) activities under the Florida Keys National Marine Sanctuary and Protection Act (16 U.S.C. 1433 note; 104 Stat. 3089); and

(D) the Everglades Construction Project of the State of Florida.

(2) STATUTORY CONSTRUCTION-

(A) EXISTING AUTHORITY- Except as otherwise expressly provided in this section, nothing in this section affects any authority in effect on the date of the enactment of this Act, or any requirement of the authority, relating to participation in restoration activities in the South Florida ecosystem, including the projects and activities specified in paragraph (1), by--

(i) the Department of the Interior;
(ii) the Department of Commerce;
(iii) the Department of the Army;
(iv) the Environmental Protection Agency;
(v) the Department of Agriculture;
(vi) the State of Florida; and
(vii) the South Florida Water Management District.

(B) NEW AUTHORITY- Nothing in this section confers any new regulatory authority on any Federal or non-Federal entity that carries out any activity authorized by this section.

(d) JUSTIFICATION-

(1) IN GENERAL- Notwithstanding section 209 of the Flood Control Act of 1970 (42 U.S.C. 1962-2) or any other provision of law, in carrying out the activities to restore, preserve, and protect the South Florida ecosystem described in subsection (b), the Secretary may determine that the activities--

(A) are justified by the environmental benefits derived by the South Florida ecosystem in general and the everglades and Florida Bay in particular; and

(B) shall not need further economic justification if the Secretary determines that the activities are cost-effective.

(2) APPLICABILITY- Paragraph (1) shall not apply to any separable element intended to produce benefits that are predominantly unrelated to the restoration, preservation, and protection of the South Florida ecosystem.

(e) COST SHARING-

(1) IN GENERAL- Except as provided in sections 315 and 316 and paragraph (2), the non-Federal share of the cost of activities described in subsection (b) shall be 50 percent.

(2) WATER QUALITY FEATURES-

(A) IN GENERAL- Except as provided in subparagraph (B), the non-Federal share of the cost of project features to improve water quality described in subsection (b) shall be 100 percent.

(B) EXCEPTION-

(i) IN GENERAL- Subject to clause (ii), if the Secretary determines that a project feature to improve water quality is essential to Everglades restoration, the non-Federal share of the cost of the feature shall be 50 percent.

(ii) APPLICABILITY- Clause (I) shall not apply to any feature of the Everglades Construction Project of the State of Florida.

(3) OPERATION AND MAINTENANCE- The operation and maintenance of projects carried out under this section shall be a non-Federal responsibility.

(4) CREDIT- Regardless of the date of acquisition, the value of lands or interests in land acquired by non-Federal interests for any activity described in subsection (b) shall be included in the total cost of the activity and credited against the non-Federal share of the cost of the activity. Such value shall be determined by the Secretary."

1.2 STUDY PURPOSE & SCOPE

1.2.1 Study Purpose

The purpose of the Restudy is to reexamine the C&SF Project to determine the feasibility of structural or operational modifications to the project essential to the restoration of the Everglades and the south Florida ecosystem, while providing for other water-related needs such as urban and agricultural water supply and flood protection in those areas served by the project. The intent of the study is to evaluate conditions within the study area and make recommendations to modify the project to restore important functions and values of the Everglades and south Florida ecosystem and plan for the water resources needs of the people of south Florida for the next 50 years.

Planning by the U.S. Army Corps of Engineers (Corps) for water resources projects is accomplished in two phases: a reconnaissance phase and a feasibility phase. The reconnaissance phase is conducted at full Federal expense, while the cost of the feasibility phase is shared between the Federal government and the non-Federal sponsor. The non-Federal sponsor for this study is the South Florida Water Management District.

The reconnaissance phase defines problems and opportunities, identifies potential solutions, and determines if planning should proceed further into the feasibility phase based on Federal interest and identification of a non-Federal sponsor willing to support further study. The reconnaissance phase of this study was initiated in June 1993 and the reconnaissance report was completed in November 1994. The objective of the reconnaissance study was to identify problems and opportunities, formulate alternative plans, evaluate conceptual alternative

plans, and recommend, if feasible, further detailed studies. The reconnaissance study helped to frame issues and set the direction for further detailed studies carried out in partnership with the local sponsor during the feasibility study.

Feasibility studies further develop the most promising alternatives and recommend a plan for authorization by Congress. The feasibility phase for this study was initiated in August 1995 following approval of the Project Study Plan by the Corps' headquarters and the Governing Board of the South Florida Water Management District. As a result of the passage of the Water Resources Development Act of 1996, a revised Project Study Plan was approved in May 1997.

The recommended plan is designed in greater detail during the preconstruction engineering and design phase, necessary real estate is then acquired, and then the project is constructed.

Figure 1-1 outlines the steps necessary to develop and implement a typical Corps project.

FIGURE 1-1
STEPS IN CORPS OF ENGINEERS PROJECT DEVELOPMENT

Reconnaissance Study	Feasibility Study	Preconstruction Engineering and Design	Real Estate Acquisition	Construction	Operation and Maintenance
Define the problems and opportunities in the study area; assess Corps and local roles in solving the problems; and develop and evaluate preliminary concepts to address the problems.	Describe and evaluate alternative plans to address the problems and realize the opportunities and fully describe a recommended project.	Complete all of the detailed technical studies and design needed to begin construction of the project. Usually overlaps the end of the Feasibility Study phase.	The non-federal sponsor acquires the necessary real estate by purchase, donation, or condemnation so that the project can be constructed, operated, and maintained. (Overlaps with construction phase).	Features that have been agreed to by the Corps, the sponsors' and other project interests are built and begin to function as needed.	All of the activities needed to allow the project to solve the problems and realize the opportunities for which the project was built are conducted. Monitoring is also included in this phase.

1.2.2 Study Scope

The purpose of this feasibility study is to develop a Comprehensive Plan for the overall regional C&SF system and the tools necessary to evaluate the Comprehensive Plan as well as separable and incremental portions of the project. This study represents the first thorough, system-wide update since the project's original inception. The Comprehensive Plan will include such features as are

necessary to provide for the regional water-related needs of the region; including flood control, the enhancement of water supplies, and other objectives served by the C&SF Project. This feasibility study included hydrologic modeling, environmental modeling, water quality analyses, and water supply studies that refined the information developed in the reconnaissance study. The feasibility study was conducted to identify a Comprehensive Plan for the C&SF Project and an adaptive implementation and operational strategy based on monitoring, evaluation, and modeling.

The Comprehensive Plan presented in this report is similar in scope to that contained in the 1948 Comprehensive Report for the Central and Southern Florida Project (House Document 80-643). This feasibility report does not include the normal level of detail that is expected from much smaller projects, such as the identification of specific sites for proposed project facilities. The Comprehensive Plan identifies components needed to restore the south Florida ecosystem, which includes the needs of all users, and the formulation process that produced them, from the viewpoint of hydrologic impacts of the regional water management system. This report also documents the uncertainties in plan selection and future tasks that will be needed to minimize these uncertainties. Engineering and real estate cost estimates are based on the analyses and assumptions made during the process of formulating and developing the components of the Comprehensive Plan. Uncertainties in design details and uncertainties in the exact location of components could impact future alternative analyses and subsequent design and cost estimates.

1.2.3 Report Organization

This feasibility report consists of a main report with an integrated Programmatic Environmental Impact Statement and appendices. The main report provides an overview of the study effort and summarizes information found in the appendices. The appendices provide detailed supporting information for all of the investigations and tasks conducted for the Restudy. In addition, a separate summary report has also been prepared

1.3 STUDY AREA

The study area encompasses approximately 18,000 square miles from Orlando to the Florida Reef Tract with at least 11 major physiographic provinces: Everglades, Big Cypress, Lake Okeechobee, Florida Bay, Biscayne Bay, Florida Reef Tract, nearshore coastal waters, Atlantic Coastal Ridge, Florida Keys, Immokalee Rise, and the Kissimmee River Valley. The Kissimmee River, Lake Okeechobee and the Everglades are the dominant watersheds that connect a mosaic of wetlands, uplands, coastal areas, and marine areas. The study area includes all or part of the

following 16 counties: Monroe, Miami-Dade, Broward, Collier, Palm Beach, Hendry, Martin, St. Lucie, Glades, Lee, Charlotte, Highlands, Okeechobee, Osceola, Orange, and Polk.

The C&SF Project, which was first authorized by Congress in 1948, is a multi-purpose project that provides flood control; water supply for municipal, industrial, and agricultural uses; prevention of saltwater intrusion; water supply for Everglades National Park; and protection of fish and wildlife resources throughout the study area. The primary system includes about 1,000 miles each of levees and canals, 150 water control structures, and 16 major pump stations. The Central and Southern Florida Project is shown on ***Figure 1-2***.

The Upper St. Johns River Basin has been excluded from this study because it is a separate hydrologic basin which is not a part of the Everglades and south Florida ecosystems. C&SF Project works in the Upper St. Johns River Basin which are expected to meet the water resources needs of that basin are nearing completion.

The following sections provide details on each of the regions that comprise this large study area. The study regions are the Kissimmee River Basin, Lake Okeechobee, Upper East Coast, Everglades Agricultural Area, Water Conservation Areas, Lower East Coast, Biscayne Bay, Everglades National Park, Florida Bay, Whitewater Bay and the Ten Thousand Islands, Florida Keys, Big Cypress Basin, and Lower West Coast. A map of the study regions is shown on ***Figure 1-3***.

1.3.1 Kissimmee River Basin

The Kissimmee River Basin is comprised of 3,013 square miles, and extends from Orlando southward to Lake Okeechobee. The watershed, which is the largest source of surface water to the lake, is about 105 miles long and has a maximum width of 35 miles.

Project works in the basin for flood control and navigation were constructed by the Corps as part of the C&SF Project. Upper Basin works consist of channels and structures that control water flows through 18 natural lakes into Lake Kissimmee. The Lower Basin includes the channelized Kissimmee River (C-38) as a 56-mile earthen canal extending from Lake Kissimmee to Lake Okeechobee.

The northern portion of the basin is comprised of many lakes, some of which have been interconnected by canals. This large sub-basin, often termed the "Upper Basin" or "Chain of Lakes", is bounded on the southern end by State Road 60, where the largest of the lakes, Lake Kissimmee, empties into the Kissimmee River.

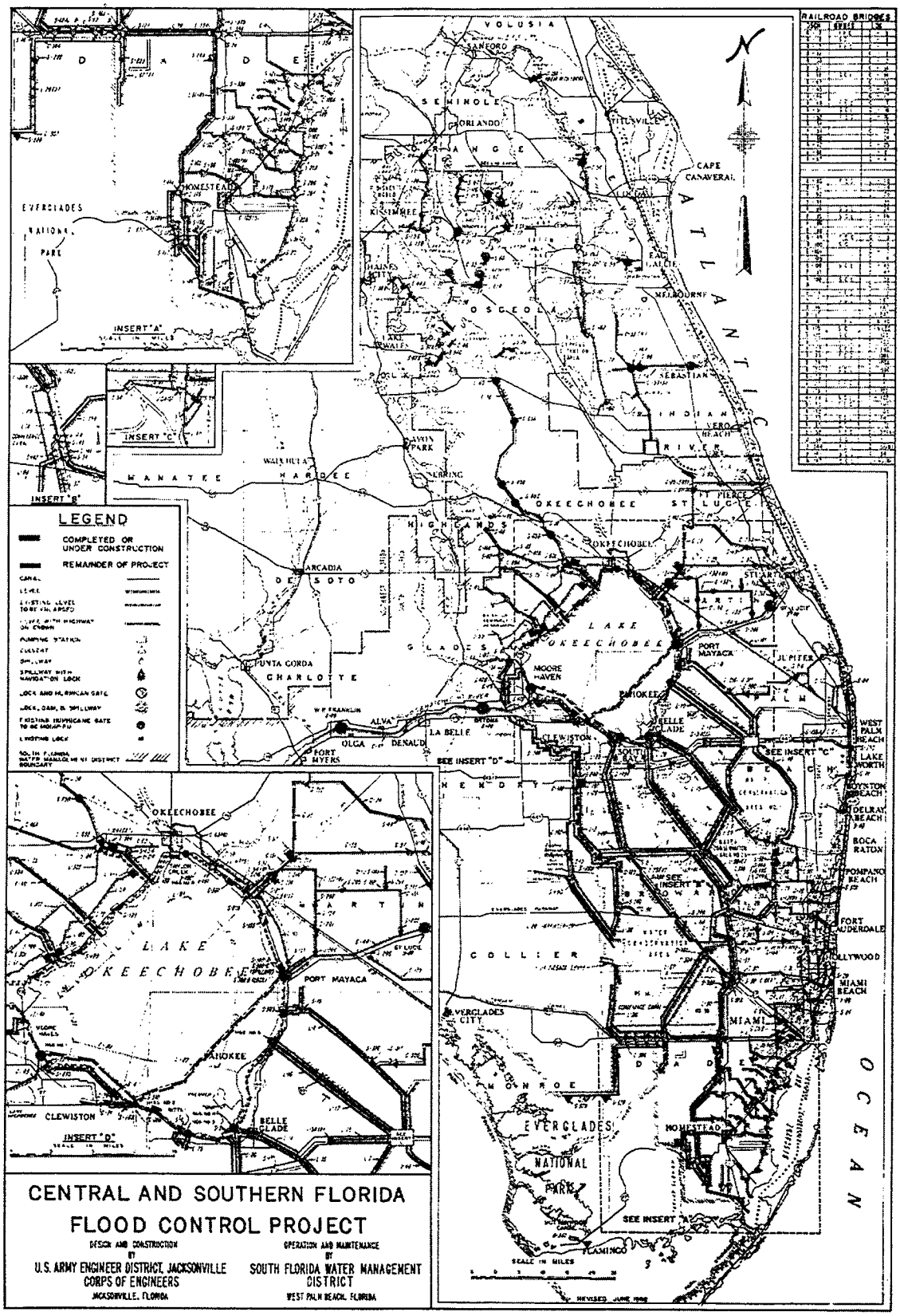

FIGURE 1-2 C&SF PROJECT MAP

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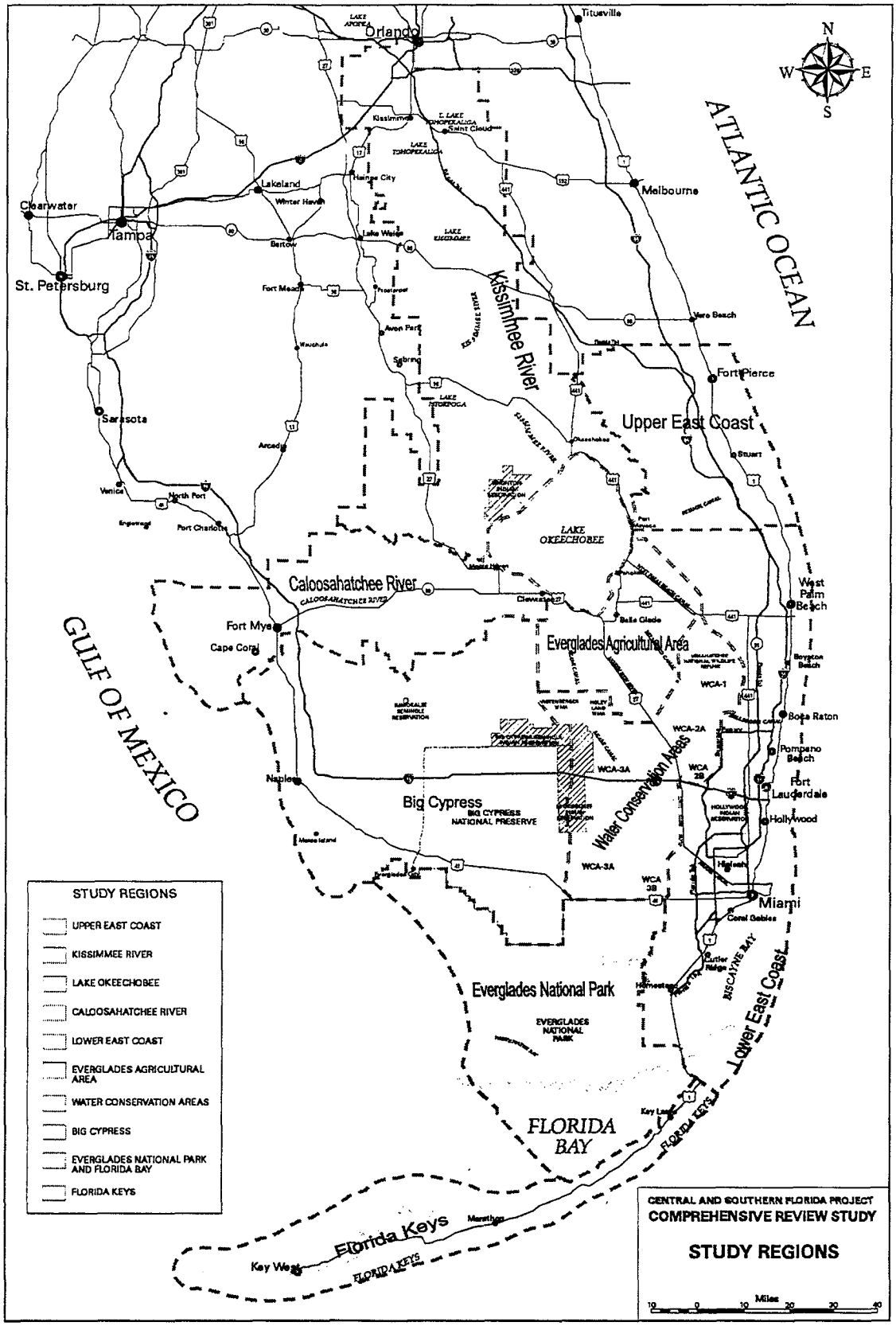

FIGURE 1-3 STUDY REGIONS

The Upper Basin is 1,633 square miles and includes Lake Kissimmee and the east and west Chain of Lakes area in Orange and Osceola Counties. A 758-square-mile Lower Basin includes the tributary watersheds of the Kissimmee River between the outlet in Lake Kissimmee and Lake Okeechobee. The 622-square-mile Lake Istokpoga area provides tributary inflow to the Lower Basin.

1.3.2 Lake Okeechobee

Lake Okeechobee lies 30 miles west from the Atlantic coast and 60 miles east from the Gulf of Mexico in the central part of the peninsula. Lake Okeechobee is a broad shallow lake occurring as a bedrock depression. The large, roughly circular lake, with a surface area of approximately 730 square miles, is the principal natural reservoir in southern Florida.

The lake's largest outlets include the St. Lucie Canal eastward to the Atlantic Ocean and the Caloosahatchee Canal and River to the Gulf of Mexico. The four major agricultural canals – the West Palm Beach, Hillsboro, North New River, and Miami Canals - have a smaller capacity, but are used whenever possible to release excess water to the Water Conservation Areas, south of the lake, when storage and discharge capacity are available. When regulatory releases from the lake are required, excess water can be passed to the three Water Conservation Areas up to the capacity of the pumping stations and agricultural canals, with the remainder going to the Atlantic Ocean and Gulf of Mexico.

The waters of the lake are impounded by a system of encircling levees, which form a multi-purpose reservoir for navigation, water supply, flood control, and recreation. Pumping stations and control structures in the levee along Lake Okeechobee are designed to move water either into or out of the lake as needed.

Other surface water bodies include the Kissimmee River, Fisheating Creek, and Taylor Creek that flow into the lake from the north; the Caloosahatchee River that flows out of the lake to the west; the St. Lucie and West Palm Beach Canals that flow out of the lake to the east; and the Hillsboro, North New River, and Miami Canals that flow out of the lake to the south. The hydroperiod of the lake is partially controlled, permitting water levels to fluctuate with flood and drought conditions and the demand for water supply.

1.3.3 Upper East Coast

The Upper East Coast area encompasses approximately 1,139 square miles and includes most of Martin and St. Lucie Counties as well as a portion of eastern Okeechobee County. Martin and St. Lucie Counties are bounded to the east by the Atlantic Ocean, and a substantial portion of Martin County's western landmass borders Lake Okeechobee. Urban development is primarily located along the coastal

areas while the central and western portions are used primarily for agriculture where the main products are citrus, truck crops, sugarcane, and beef and dairy products.

The land is generally flat, ranging in elevation from 15 to 60 feet NGVD[1] in the western portion with an average elevation of 28 feet. The coastal area ranges from sea level to 25 feet. The coastal sand hills adjacent to the Atlantic Intracoastal Waterway are higher than most parts of the county and reach a maximum elevation of 60 feet. This feature is known as the Atlantic Coastal Ridge.

The natural drainage has been significantly altered by the construction of canals, drainage ditches and numerous water control structures which predominately direct stormwater discharge to the east coast. The area contains the C&SF Project Canals C-23[2], C-24, and C-25 drainage basins and the drainage area served by C-44 (St. Lucie Canal).

The St. Lucie Canal is Lake Okeechobee's eastern outlet, extending 25.5 miles from Port Mayaca to the city of Stuart, where it terminates at the south fork of the St. Lucie River. The St. Lucie River Basin is part of a much larger southeastern Florida basin that drains over 8,000 square miles. The St. Lucie River, composed of the North and South forks, lies in Martin and St. Lucie Counties in the northeastern portion of the basin. The South Fork is a relatively short stretch of river. The North Fork, designated as an aquatic preserve by the State of Florida, begins south of Fort Pierce and flows past the city of Port St. Lucie to the St. Lucie River Estuary.

The St. Lucie Estuary is part of a larger estuarine system known as the Indian River Lagoon. The Indian River Lagoon has been designated an estuary of national significance and is a component of the U. S. Environmental Protection Agency sponsored National Estuary program. The Indian River Lagoon is also designated as a state priority water body for protection and restoration under the state's Surface Water Improvement and Management (SWIM) Act. The Surface Water Improvement and Management Act Plan identifies excessive freshwater runoff from the St. Lucie Estuary watershed as a problem within the St. Lucie Estuary.

Much of the St. Lucie River has been channelized and many drainage canals empty into the river, particularly the St. Lucie Canal, C-23 and C-24. The St. Lucie Canal, the largest overflow canal for Lake Okeechobee, is a navigation channel 8 feet deep and 100 feet wide connecting the Atlantic Intracoastal Waterway in Stuart with Lake Okeechobee at Port Mayaca.

1 National Geodetic Vertical Datum

2 C&SF Project feature designations: C for canals, L for levees, and S for water control structures and pumping stations.

1.3.4 Everglades Agricultural Area

The lands located immediately south and southeast of the lake are known as the Everglades Agricultural Area. This area of about 700,000 acres is rich, fertile agricultural land. A large portion of the Everglades Agricultural Area is devoted to the production of sugarcane. The average ground elevation is about 12 feet.

The occurrence of surface water in the area is now a direct result of the construction of the numerous conveyance and drainage canals. The primary canals consist of the Miami, the North New River, the Hillsboro, and the West Palm Beach Canals, which traverse the area north south, and the Bolles and Cross Canal, which extends east-west. Water levels and flows are stringently manipulated in the canals to achieve optimum crop growth. Major surface impoundments in the area are non-existent.

1.3.5 Water Conservation Areas

The Water Conservation Areas are an integral component of the Everglades and freshwater supplies for south Florida. The Water Conservation Areas, located south and east of the Everglades Agricultural Area, comprise an area of about 1,350 square miles, including 1,337 square miles of the original Everglades, which averaged some 40 miles in width and extended approximately 100 miles southward from Lake Okeechobee to the sea.

The Water Conservation Areas provide a detention reservoir for excess water from the agricultural area and parts of the Lower East Coast region, and for flood discharge from Lake Okeechobee. The Water Conservation Areas also provide levees needed to prevent Everglades floodwaters from inundating the Lower East Coast, while providing water supply for Lower East Coast agricultural lands and Everglades National Park; improving water supply for east coast communities by recharging the Biscayne Aquifer (the sole source of drinking water for southern Palm Beach, Broward, Miami-Dade, and Monroe Counties); retarding salt water intrusion in coastal well fields; and benefiting fish and wildlife in the Everglades.

Water Conservation Area 1 is designated as the Arthur R. Marshall Loxahatchee National Wildlife Refuge, managed by the U.S. Fish and Wildlife Service. Water Conservation Areas 2 and 3 are public hunting and fishing areas comprising the Everglades Wildlife Management Area maintained by the Florida Game and Fresh Water Fish Commission. The Seminole and Miccosukee Tribes each have reserved rights within Water Conservation Area 3.

1.3.5.1 Water Conservation Area 1

Water Conservation Area 1 (Loxahatchee National Wildlife Refuge) is about 21 miles long from north to south and comprises an area of 221 square miles. The

West Palm Beach Canal lies at the extreme northern boundary, and on the south the Hillsboro Canal separates Water Conservation Area 1 from Water Conservation Area 2. Ground elevations slope about five feet in 10 miles, both to the north and to the south from the west center of the area, varying from over 16 feet in the northwest to less than 12 feet in the south. The area, which is enclosed by about 58 miles of levee (approximately 13 miles of which are common to Water Conservation Area 2), provides storage for excess rainfall, excess runoff from agricultural drainage areas of the West Palm Beach Canal (230 square miles) and the Hillsboro Canal (146 square miles), and excess water from Lake Okeechobee. Inflow comes from rainfall and runoff from the Everglades Agricultural Area through canals at the northern end. Release of water for dry-season use is controlled by structures in the West Palm Beach Canal, the Hillsboro Canal, and in the north-south levee which forms the eastern boundary of the area. When stages exceed the regulation schedule, excess water in Water Conservation Area 1 is discharged to Water Conservation Area 2.

1.3.5.2 Water Conservation Area 2

Water Conservation Area 2 is comprised of two areas, 2A and 2B, measures about 25 miles from north to south, and covers an area of 210 square miles. It is separated from the other Water Conservation Areas by the Hillsboro Canal on the north and the North New River Canal on the south. Ground elevations slope southward about two to three feet in 10 miles, ranging from over 13 feet NGVD in the northwest to less than seven feet NGVD in the south. The area is enclosed by about 61 miles of levee, of which approximately 13 miles are common to Water Conservation Area 1 and 15 miles to Water Conservation Area 3. An interior levee across the southern portion of the area reduces water losses due to seepage into an extremely pervious aquifer at the southern end of the pool and prevents overtopping of the southern exterior levee by hurricane waves.

The upper pool, Water Conservation Area 2A, provides a 173-square-mile reservoir for storage of excess water from Water Conservation Area 1 and a 125-square-mile agricultural drainage area of the North New River Canal. Storage in Water Conservation Area 2A provides water supply to the east coast urban areas of Broward County. Water enters the area from Water Conservation Area 1 and the Hillsboro Canal on the northeast side, and from the North New River Canal on the northwest side. Water in excess of that required for efficient operation of Water Conservation Area 2A is discharged to Water Conservation Area-3 via structures into C-14, the North New River Canal, and Water Conservation Area 2B.

Water Conservation Area 2B has ground elevations ranging from 9.5 feet NGVD in the northern portions down to 7.0 feet NGVD in the southern portions of the area. The area experiences a high seepage rate, which does not allow for long term storage of water, and as a result, water is not normally released from the area.

1.3.5.3 Water Conservation Area 3

Water Conservation Area 3 is also divided into two parts, 3A and 3B. It is about 40 miles long from north to south and comprises about 915 square miles, making it the largest of the conservation areas. Ground elevations, which slope southeasterly 1 to 3 feet in 10 miles, range from over 13 feet NGVD in the northwest to 6 feet NGVD in the southeast. The Miami Canal traverses the area from northwest to southeast, and the North New River Canal separates it from Water Conservation Area 2. The area is enclosed by about 111 miles of levee, of which 15 miles are common to Water Conservation Area 2. An interior levee system across the southeastern corner of the area reduces seepage into an extremely pervious aquifer.

The upper pool, Water Conservation Area 3A, provides a 752-square-mile area for storage of excess water from Water Conservation Area 2A; rainfall excess from approximately 750 square miles in Collier and Hendry Counties and from 71 square miles of the former Davie agricultural area lying east of Pumping Station S-9 in Broward County; and excess water from a 208-square-mile agricultural drainage area of the Miami Canal and other adjacent areas to the north. Water enters Water Conservation Area 3A from various sources on the northern and eastern sides. The storage is used to meet the principal water supply needs of adjacent areas, including urban water supply and salinity control requirements for Miami-Dade and Monroe County, irrigation requirements, and water supply for Everglades National Park.

1.3.6 Lower East Coast Area

The Lower East Coast area, which consists of the coastal ridge section in Palm Beach, Broward, and Miami-Dade Counties, is a strip of sandy land which lies east of part of the Water Conservation Areas. The ground surface of the flatlands in the west ranges from about 25 feet NGVD in the upper part of the region to about five feet NGVD in lower Miami-Dade County. The Atlantic Coastal Ridge is comprised of broad, low dunes and ridges with elevations ranging from 10 to 25 feet NGVD. This ridge area ranges from two to four miles in width at its northern edge to its southern edge in Miami. South of Miami the ridge becomes less pronounced but significantly wider.

The Lower East Coast area is the most densely populated part of the state. The largest population centers are near the coast and include the cities of Miami, West Palm Beach, Fort Lauderdale, and Hollywood. Water levels in coastal canals are controlled near the coastal shoreline to prevent overdrainage and to resist salt water intrusion. Low water levels in these canals may enable salt water to migrate into the ground water, well fields, and natural freshwater systems upon which the urban areas depend for a potable water supply.

This area is characterized by sandy flatlands to the west, the sandy coastal ridge, and the coastal marsh and mangrove swamp areas along the Atlantic seaboard. The northern portion, generally that part north of Miami-Dade County, marks the shore of a higher Pleistocene Sea and occurs as one or more relict beach ridges. The southern portion appears to be marine deposited sands or marine limestones.

Extensive development has resulted in nearly complete urbanization of the coastal region from West Palm Beach southward through Miami, and these physiographical characteristics of the region have been greatly overshadowed. South of Miami, in Miami-Dade County, this coastal area widens as the Everglades bends to the west to include urban areas and agricultural areas that extend almost to the southern coast. Miami-Dade County's agricultural industry covers more than 83,000 acres in the southwest of the coastal metropolitan area. Vegetables, tropical fruits, and nursery plants are grown in this area.

1.3.7 Biscayne Bay

Biscayne Bay is a shallow, tidal sound located near the extreme southeastern part of Florida. Biscayne Bay, its tributaries and Card Sound are designated by the state of Florida as aquatic preserves, while Card and Barnes sounds are part of the Florida Keys National Marine Sanctuary. A significant portion of the central and southern portions of Biscayne Bay comprise Biscayne National Park.

The original areal extent of Biscayne Bay approximated 300 square miles, but it has since undergone major areal modifications, particularly in its northern portions, as a result of development. The bay extends about 55 miles in a south-southwesterly direction from Dumfoundling Bay on the north to Barnes Sound on the south. It varies in width from less than 1 mile in the vicinity of the Atlantic Intracoastal Waterway passage to Dumfoundling Bay, to about 10 miles between the mainland and the Safety Valve Shoals to the east.

While there has been extensive dredging and filling within northern Biscayne Bay, the area still supports a productive and healthy seagrass bed and a few tracts of natural shoreline remain. Northern Biscayne Bay's headwaters are now considered to include dredged areas known as Maule Lake and Dumfoundling Bay, near the northern boundary of Miami-Dade County.

Central and, in particular, southern Biscayne Bay have been impacted less by development than northern Bay. For instance, mangrove-lined coastal wetlands extend from Matheson Hammock Park south along the entire shoreline of Biscayne National Park, Card and Barnes Sounds, a distance of approximately 30 miles. These coastal wetlands are the largest tract of undeveloped wetlands remaining in

south Florida outside of Everglades National Park, the Big Cypress Preserve, and the Water Conservation Areas.

Biscayne National Park, in southern Biscayne Bay was established in 1980 to protect and preserve this nationally significant marine ecosystem consisting of mangrove shorelines, a shallow bay, undeveloped islands, and living coral reefs. The park is 180,000 acres in size and 95 percent water. The shoreline of southern Biscayne Bay is lined with a forest of mangroves and the bay bottom is covered with dense seagrass beds. The park has been designated a sanctuary for the Florida spiny lobster. Biscayne Bay and Biscayne National Park support a multitude of marine wildlife such as lobster, shrimp, fish, sea turtles, and manatees. The coral reefs within the Biscayne National Park support a diverse community of marine plant and wildlife.

Depending upon the flood stages reached, all C&SF Project canals in adjacent Miami-Dade County can carry floodwaters to Biscayne Bay. However, much of the time, discharges from project canals represent primarily runoff or seepage from within the flood protected area of the county. These flows originate in the extensive networks of secondary drainage canals and storm sewers that discharge into the project canals. Supplementing the complex system of project canals and secondary drainage systems are many hundreds of other stormwater drainage canals and storm sewer outfalls within Miami-Dade County that discharge freshwater directly into Biscayne Bay.

1.3.8 Everglades National Park

Everglades National Park encompasses 2,353 square miles of wetlands, uplands, and submerged lands at the southern end of the Florida peninsula. The topography is extremely low and flat, with most of the area below four feet NGVD. The highest elevations are found in the northeastern section of the park and are from six to seven feet NGVD. The saline wetlands, including mangrove and buttonwood forests, salt marshes, and coastal prairie that fringe the coastline are subject to the influence of salinity from tidal action.

Everglades National Park, authorized by Congress in 1934 and established in 1947, was established to protect the unique tropical biological resources of the southern Everglades ecosystem. It was the first national park to be established to preserve purely biological (vs. geological) resources. The park's authorizing legislation mandated that it be managed as "...wilderness, [where] no development... or plan for the entertainment of visitors shall be undertaken which will interfere with the preservation intact of the unique flora and fauna and the essential primitive natural condition now prevailing in this area." This mandate to preserve wilderness is one of the strongest in the legislative history of the National Park System.

Everglades National Park has been recognized for its importance, both as a natural and cultural resource as well as for its recreational value, by the international community and the national and state government. At the international level, the park is a World Heritage Site, an International Biosphere Reserve, and a Wetland of International Significance. In 1978, Congress designated much of the park, (86%) as Wilderness under the Wilderness Act of 1964. In 1997, this area was redesignated the Marjory Stoneman Douglas Wilderness. Hell's Bay Canoe Trail and the Wilderness waterway are designated National Trails. The State of Florida has designated the Park an Outstanding Florida Water.

The Park preserves a unique landscape where the temperate zone meets the subtropics, blending the wildlife and vegetation of both. The landscape includes sawgrass sloughs, tropical hardwood hammocks, offshore coral reefs, mangrove forests, lakes, ponds, and bays, providing habitat for dozens of threatened and endangered species of plants and animals. It is the largest designated wilderness, at 1,296,500 acres, east of the Rocky Mountains. It protects the largest continuous stand of sawgrass prairie in North America, the most significant breeding grounds for tropical wading birds in North America, over 230,100 acres of mangrove forest (the largest in the western hemisphere), a nationally significant estuarine complex in Florida Bay and significant ethnographic resources, revealing 2,000 years of human occupation.

1.3.9 Florida Bay, Whitewater Bay, and the Ten Thousand Islands

Florida Bay and the Ten Thousand Islands comprise 1,500 square miles of Everglades National Park. The bay is shallow, with an average depth of less than three feet. To the north is the Florida mainland and to the south lie the Florida Keys. Sheet flow across marl prairies of the southern Everglades and 20 creek systems fed by Taylor Slough and the C-111 Canal provide direct inflow of fresh surface water and groundwater recharge. Surface water from Shark River Slough, the sub-region's largest drainage feature, flows into Whitewater Bay and also may provide essential groundwater recharge for central and western Florida Bay. Exchange with Florida Bay occurs as this lower salinity water mass flows around Cape Sable into the western subregion of the bay.

1.3.10 Florida Keys

The Florida Keys are a limestone island archipelago extending southwest over 200 miles from the southern tip of the Florida mainland to the Dry Tortugas, 63 miles west of Key West. They are bounded on the north and west by the relatively shallow waters of Biscayne Bay, Barnes and Blackwater Sounds, Florida Bay - all areas of extensive mud shoals and seagrass beds – and the Gulf of Mexico. Hawk Channel lies to the south, between the mainland Keys and an extensive reef tract 5 miles offshore. The Straits of Florida lie beyond the reef, separating the Keys from Cuba and the Bahamas.

The Keys are made up of over 1,700 islands encompassing approximately 103 square miles. They are broad, with little relief, have a shoreline length of 1,865 miles, and are inhabited from Soldier Key to Key West. Key Largo and Big Pine Key are the largest islands. The Keys are frequently divided into three regions: 1) the Upper Keys, north of Upper Matecumbe Key; 2) the Middle Keys, from Upper Matecumbe Key to the Seven Mile Bridge; and 3) the Lower Keys, from Little Duck Key to Key West.

The Florida Keys National Marine Sanctuary encompasses approximately 3,668 square miles of submerged lands and waters between the southern tip of Key Biscayne and the Dry Tortugas Bank. North of Key Largo it includes Barnes and Card Sounds, and to the east and south the oceanic boundary is the 300-foot isobath. The Sanctuary also contains part of Florida Bay and the entire Florida Reef Tract, the largest reef system in the continental United States. The Sanctuary contains components of five distinct physiographic regions: Florida Bay, the Southwest Continental Shelf, the Florida Reef Tract, the Florida Keys, and the Straits of Florida. The regions are environmentally and lithologically unique, and together they form the framework for the Sanctuary's diverse terrestrial and aquatic habitats.

1.3.11 Florida Reef Tract

The Florida Reef Tract is an arcuate band of living coral reefs paralleling the Keys. The reefs are located on a narrow shelf that drops off into the Straits of Florida. The shelf slopes seaward at a 0.06 degree angle into Hawk Channel, which is several miles wide and averages 50 feet deep. From Hawk Channel, the shelf slopes upward to a shallower area containing numerous patch reefs. The outer edge is marked by a series of bank reefs and sand banks that are subject to open tidal exchange with the Atlantic. The warm, clear, naturally low-nutrient waters in this region are conducive to reef development.

1.3.12 Big Cypress Basin

Big Cypress Swamp spans approximately 1,205 square miles (771,000 acres) from southwest of Lake Okeechobee to the Ten Thousand Islands in the Gulf of Mexico. The 570,000-acre Big Cypress National Preserve was established by *Public Law 93-440* in 1974 to protect natural and recreational values of the Big Cypress watershed and to allow for continued traditional uses such as hunting, fishing, and oil and gas production. It was also established to provide an ecological buffer zone and protect Everglades National Park's water supply. In 1988, Congress passed the *Big Cypress National Preserve Addition Act* which will add 146,000 acres to the preserve.

1.3.13 Lower West Coast

The Lower West Coast region covers approximately 4,000 square miles in Lee, Hendry, Glades, and Collier Counties and a portion of Charlotte County. This area is generally bounded by Charlotte County to the north, Lake Okeechobee and the Everglades Agricultural Area to the east, the Big Cypress National Preserve to the south, and the Gulf of Mexico to the west. The area is characterized by the sandy flatlands region of Lee County, which give way to sandy though more rolling terrain in Hendry County; and the coastal marshes and mangrove swamps of Collier County.

The Caloosahatchee River sub-watershed includes an area of 550,900 acres in parts of Lee, Glades, Charlotte, and Hendry Counties. From a hurricane gate on the southwest shore of Lake Okeechobee at Moore Haven, the Caloosahatchee Canal drains westerly for about five miles through a very flat terrain into Lake Hicpochee. From there the canal joins the upper reach of the Caloosahatchee River. On its way to the Gulf of Mexico, the river is controlled by navigation locks at Ortona (15 miles downstream from Moore Haven) and at Olga near Fort Myers. Downstream from Ortona Lock, many tributaries join the river along its course to the Gulf. The Caloosahatchee River serves as a portion of the cross-state Okeechobee Waterway, which extends from Stuart on the east coast via the St. Lucie Canal, through Lake Okeechobee and the Caloosahatchee River to Fort Myers on the Gulf of Mexico. The river has been straightened by channelization through most of its 65-mile course from the Moore Haven Lock to Fort Myers.

The J. N. "Ding" Darling National Wildlife Refuge Complex includes Pine Island NWR, Island Bay NWR, Matlacha Pass NWR, and Caloosahatchee NWR, all located on the lower west coast. The health of the estuarine ecosystem they embody is directly tied to the water quality, quantity and timing of flows from the Caloosahatchee watershed and those watersheds which drain into the Caloosahatchee River (i.e. Kissimmee River and Lake Okeechobee watersheds).

1.4 NATIONAL ENVIRONMENTAL POLICY ACT REQUIREMENTS

The National Environmental Policy Act of 1969, as amended, is the nation's charter for environmental protection. The National Environmental Policy Act establishes policy, sets goals, and provides means for carrying out the policy. Section 102(2) of the Act contains action-forcing provisions to make sure that Federal agencies act according to the letter and spirit of the Act, including a provision to prepare a detailed statement - now called an Environmental Impact Statement - on the effects of a proposed Federal action. The Federal regulations for implementing the procedural provisions of the National Environmental Policy Act were published by the Council on Environmental Quality in the Code of Federal

Regulations (CFR) as 40 CFR Parts 1500-1508 (43 Federal Register 55978-56007, November 29, 1978).

This report documents the Corps study of modifications to the C&SF Project to restore the south Florida ecosystem while providing for the other water-related needs of the region in compliance with the National Environmental Policy Act requirements. It employs two concepts established in the Council on Environmental Quality's National Environmental Policy Act regulations - integration and tiering - that are not frequently used, but are appropriate to the planning and design process and schedule for modifications to the C&SF Project that result from the Restudy.

Integration is based on the Council on Environmental Quality provision to combine documents, which states that *"any environmental document in compliance with NEPA may be combined with any other agency document to reduce duplication and paperwork"* (40 CFR 1506.4). The Corps regulations permit an Environmental Impact Statement ("environmental document") to be either a self-standing document combined with and bound within a feasibility report ("agency document"), or an integration of National Environmental Policy Act-required discussions in the text of the report. In view of the ecosystem restoration aspect of the C&SF Project Restudy, and to reduce paperwork and redundancies, and consolidate documentation into one consistent report, the Corps elected to integrate discussions that normally would appear in an Environmental Impact Statement into the feasibility report. Sections in this integrated report that include National Environmental Policy Act-required discussions are marked with an asterisk in the Table of Contents to assist readers in identifying such material.

Tiering was established by the Council on Environmental Quality to provide *"coverage of general matters in broader environmental impact statements (such as national program or policy statements) with subsequent narrower statements or environmental analyses (such as regional or basin-wide program statements or ultimately site-specific statements).... Agencies are encouraged to tier their environmental impact statements to eliminate repetitive discussions of the same issues and to focus on the actual issues ripe for decision at each level of environmental review"* (40 CFR 1508.28 and 1502.20). Tiering has been applied to proposed Federal actions for modifying the C&SF Project as follows:

> *This document is a Programmatic Environmental Impact Statement, which addresses at a general level, the alternatives and environmental effects of the overall project, to the affected environment. Due to the conceptual nature of the Comprehensive Plan and the associated uncertainties, many subsequent site-specific environmental documents will be required for the individual separable project elements. These documents will be either Supplemental Environmental Impact Statements or Environmental Assessments building upon this integrated document, and addressing the individual project separable elements in sufficient detail for final*

decision making and for full compliance with the National Environmental Policy Act requirements.

1.5 STUDY PROCESS

Because of the public, political, and media interest in the restoration of the south Florida ecosystem, the process used to accomplish this study was considered carefully. At the inception of the reconnaissance study in 1993, it was recognized that a "not business as usual" approach was needed to successfully manage and accomplish a system-wide study that addresses all of the water resource problems and opportunities in the region. This approach was continued in the feasibility phase of the Restudy.

Accomplishment of this feasibility study was primarily the responsibility of the Corps of Engineers, Jacksonville District, and the non-Federal cost sharing partner, the South Florida Water Management District. The Restudy Team consisted of an interdisciplinary/interagency professional staff drawn from the technical disciplines necessary to accomplish the study. In February 1995, the Governing Board of the South Florida Water Management District adopted a resolution directing staff to further develop its strong interagency coordination effort to ensure that the South Florida Water Management District's water supply planning efforts and the Restudy were consistent and cohesive. In furtherance of this resolution, key members of the South Florida Water Management District's Lower East Coast Regional Water Supply Planning Team joined the Restudy Team to maximize the integration of these processes.

A multiagency approach was used to staff the Restudy Team due to the complexity of the problems to be considered and the continued desire to utilize the skills of specialists in other agencies. Multiagency staffing was essential to facilitate the flow of needed information among agencies, and, more importantly, to achieve approval and ownership by the key public agency stakeholders. This multi-agency approach also fits into the cooperative spirit fostered by the South Florida Ecosystem Restoration Task Force and the Governor's Commission for a Sustainable South Florida discussed in other sections of this report. The Restudy Team included personnel from other Federal agencies such as the National Park Service, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the United States Geologic Survey, the Natural Resources Conservation Service, and the U.S. Environmental Protection Agency. Tribal participation included the Seminole and Miccosukee Tribes. State agency participation included the Florida Game and Fresh Water Fish Commission, the Florida Department of Environmental Protection, and the Florida Department of Agriculture and Consumer Services. Local governments including Miami-Dade County, Broward County, Palm Beach County, Martin County and Lee County also participated.

1.6 THE CENTRAL AND SOUTHERN FLORIDA PROJECT

In 1947, 100 inches of rain fell on south Florida, more than tripling the region's total rainfall for 1945 and ending one of the worst droughts in Florida history. In a few weeks, the rain had drenched farmland and filled lakes and canals. Then in the space of just 25 days, two hurricanes and a tropical disturbance dumped more water on an already saturated area. When the rains finally ceased, 90 percent of southeastern Florida, from Orlando to the Keys, was under water. The Corps estimated the total damage of this disaster at more than $59,000,000.

Following the disastrous flood in 1947, the problems of the area came to a climax. This flood, coupled with the experiences of the drought in 1945 and the intrusion of saltwater into the aquifer made it imperative that immediate corrective action be started. These actions were needed to prevent further loss of life and damage to property because of floods, and to conserve water for beneficial uses during periods of drought.

Acting upon the requests of many local agencies concerned with flood control and water conservation, and under the authority of various flood control acts, river and harbor acts of Congress, and resolutions of appropriate congressional committees, the Corps' Jacksonville District conducted public hearings throughout the area to determine the desires of the many local interests and to collect data from which to formulate a plan.

Views expressed during the public hearings stated that the problems were too large and complex for the capabilities of either the State of Florida or local agencies acting alone, therefore making it practically impossible for either to draft a plan that would be satisfactory to all. A Comprehensive Plan for flood control and water conservation, which would encompass the entire area, while satisfying the major needs expressed by the various agencies, would be beneficial to the greatest number and to the largest portion of the area, and be performed by the Federal government, with local cooperation, seemed to offer the best solution.

A comprehensive report was prepared by the Corps and submitted to higher authority on December 19, 1947. This report stated that the problems of flood protection, drainage, and water control were considered to be physically inter-related, and that the St. Johns, Kissimmee, Lake Okeechobee, Caloosahatchee, and Everglades drainage areas all formed a single economic unit. Accordingly, it recommended a comprehensive program in the interest of *"flood control, drainage and related purposes."*

Congress approved the plan as part of the *Flood Control Act of June 30, 1948,* and the report was published in *House Document No. 643, 80th Congress, Second*

Session. The basic purpose of the overall Central and Southern Florida Flood Control Project, quoted from *House Document No. 643,* reads:

> *"In its natural state the part of central and southern Florida considered in this report was a vast wilderness of water, forest, prairie, and marshland. The forces of nature had combined to establish a fine balance which supported the vegetable, animal and human life that prevailed and resulted in building up the land to the condition in which white man first found it. A large part of this land, the Everglades, was still in a formative stage when its development began. The inherent fertility of the area and its resources made its development and use inevitable. This development, however, resulted in physical changes which altered the natural balance between water and soil, and much of the development was undertaken without any real knowledge of the area or of the hazards involved. The parched prairies and burning mucklands of the Everglades in 1945, the flooding of thousands of acres of farms and communities in 1947, and the intrusion of salt water into land water supplies of the east coast are basically the results of altering the balance of natural forces. The basic problem of this area is, therefore, to restore the natural balance between soil and water in this area insofar as possible by establishing protective works, controls, and procedures for conservation and use of water and land."*

The Governor of Florida approved the plan for the State of Florida in February 1948. The following year, the Florida State Legislature formed the Central and Southern Florida Flood Control District, later to become the South Florida Water Management District, to act as a single agency with which the Federal government could deal on all matters of local cooperation.

The C&SF Project, first phase, was authorized by the *Flood Control Act of June 30, 1948* for the purposes of flood control, water level control, water conservation, prevention of salt water intrusion, and preservation of fish and wildlife. The first phase consisted of most of the works necessary to afford flood protection to the agricultural development south of Lake Okeechobee and to the highly developed urban area along the Lower East Coast of the State. The second phase, consisting of all remaining works of the original *Comprehensive Plan,* was authorized by the *Flood Control Act of September 3, 1954.*

Improvements in Hendry County and Nicodemus Slough (just west of Lake Okeechobee) were added to the project by the *Flood Control Acts of July 3, 1958, and July 14, 1960,* respectively. Improvements in Boggy Creek, Cutler Drain Area, Shingle Creek, South Miami-Dade County, and West Palm Beach Canal were added to the project by the *Flood Control Act of October 23, 1962.* Improvements in southwest Miami-Dade County were added to the project by the *Flood Control Act of October 27, 1965*; the same act also modified the 1958 authorization for the Hendry County improvements.

The Flood Control Act of 1968 expanded the project to provide for increased storage and conservation of water and for improved distribution of water

throughout much of the project area and added recreation as a project purpose. Flood control measures for Martin County were added. The 1968 modifications would also facilitate increased delivery of water to Everglades National Park.

Section 2 of Public Law 91-282 enacted June 19, 1970, authorized appropriations for the Corps to accelerate:

> *"construction of borrow canal L-70, canal C-308, canal C-119W, and pumping station S-326, together with such other works in the plan of improvement as the Director of the National Park Service and the Chief of Engineers agree are necessary to meet the water requirements of the Everglades National Park: Provided further, That as soon as practicable and in any event upon completion of the works specified in the preceding proviso, delivery of water from the central and southern Florida project to the Everglades National Park shall be not less than 315,000 acre-feet annually, prorated according to the monthly schedule set forth in the National Park Service letter of October 20, 1967, to the Office of the Chief of Engineers, or 16.5 per centum of total deliveries from the project for all purposes including the park, whichever is less."*

Section 104 of the Everglades National Park Protection and Expansion Act of 1989 (Public Law 101-229) directed the Corps:

> *"to construct modifications to the Central and Southern Florida Project to improve water deliveries into the park and shall, to the extent practicable, take steps to restore the natural hydrological conditions within the park."*

The *Water Resources Development Act of 1992* (Public Law 102-580) authorized modifications to the C&SF Project for ecosystem restoration of the Kissimmee River. Both the Kissimmee River Restoration and the Headwaters Revitalization Projects were authorized.

The authorizing acts require that local interests provide all lands, easements, and rights-of-way; pay for relocations of highways (with certain exceptions), highway bridges, and public utilities which may be required for construction of project works; hold and save the United States free from damages resulting from construction and operation of the works; maintain and operate all works (except certain major regulating structures) after completion and make a cash contribution for each part of the work prior to its initiation.

Construction of the Federal project was began in January 1950. The project provides for an east coast protective levee extending from the Homestead area north to the eastern shore of Lake Okeechobee near the St. Lucie Canal. There are three conservation areas for water impoundment in the Everglades area, west of the east coast protective levee, with control structures to transfer water as necessary. There are also local protective works along the Lower East Coast with an encirclement of the Lake Okeechobee agricultural area by levees and canals. Enlargement of

portions of the Miami, North New River, Hillsboro, and West Palm Beach Canals and existing Lake Okeechobee levees are part of the project. Also included are construction of new levees on the northeast and northwest shores of Lake Okeechobee; increased outlet capacity for improved control of Lake Okeechobee; floodway channels in the Kissimmee River Basin, with suitable control structures to prevent overdrainage; and facilities for regulation of floods in the Upper St. Johns River Basin.

The project also provides water control and protection from the recurrence of flood waters for the highly developed urban area along the Lower East Coast of Florida and for the agricultural areas around Lake Okeechobee (including the towns around the lake), in the Upper St. Johns and Kissimmee River Basins, and in south Miami-Dade County. Another project function is the conservation of flood waters for beneficial uses during dry seasons. In accordance with *Public Laws 91-282 and 101-229*, the project also delivers water to Everglades National Park according to a set schedule.

The Corps operates and maintains project works on the St. Lucie Canal; Caloosahatchee River; Lake Okeechobee levees, channels, locks, and major spillways; and the main outlets for Water Conservation Areas 1, 2A, and 3A. The South Florida Water Management District operates the remainder of the project in accordance with regulations prescribed by the Corps. The non-Federal sponsor has an essential role with the Corps in developing water management criteria for the C&SF Project. The non-Federal sponsor is responsible for allocation of water from project storage, except where mandated by Federal law.

1.7 OTHER STUDIES, REPORTS, AND PROJECTS

1.7.1 C&SF Project Authorizations

As noted in the previous section, since its initial authorization in 1948, there have been a number of additional authorizations that have modified the C&SF Project. These authorizations to the project were based on many studies conducted by the Corps. In addition, a number of discretionary changes have been made to the authorized project features in accordance with the discretionary authority granted to the Chief of Engineers by Congress. ***Appendix L - Prior Studies, Reports, and Projects*** provides a detailed description of all the modifications to the project. ***Table 1-1*** summarizes the project authorizations and the project purposes added or modified by these authorizations.

TABLE 1-1
C&SF PROJECT AUTHORITIES

PROJECT PURPOSE	1948 PL 80-858	1954 PL 83-780	1958 PL 85-500	1960 PL 86-645	1962 PL 87-874	1965 PL 89-298	1968 PL 90-483	1970 PL 91-282	1970 HD 91-394	1983 PL 98-181	1988 PL 100-676	1989 PL 101-229	1992 PL 102-580	1996 PL 104-303
Flood Control	X	X	X	X	X	X	X			X		X		X
Drainage/Water Control	X	X	X	X	X	X	X							
Groundwater Recharge	X	X			X	X								
Salinity Intrusion	X	X			X		X							
Everglades National Park Water Supply	X	X					X	X		X		X		X
Fish/Wildlife Preservation	X	X	X		X		X							
Navigation	X	X					X		X					
Water Supply	X	X					X							
Environmental Protection/ Restoration											X	X	X	X
Recreation	X				X		X							
Irrigation							X							
Hydrologic Ecosystem Model											X			

PL 80-858 - Flood Control Act of 1948
PL 83-780 - Flood Control Act of 1954
PL 85-500 - Flood Control Act of 1958
PL 86-645 - Flood Control Act of 1960
PL 87-874 - Flood Control Act of 1962
PL 89-298 - Flood Control Act of 1965
PL 90-483 - Flood Control Act of 1968
PL 91-282 - River Basin Monetary Authorization and Miscellaneous Civil Works Amendments Act of 1970
HD 91-394 - Central and Southern Florida Small-Boat Navigation (Authorized under Section 201 of the Flood Control Act of 1965)
PL 98-181 - Supplemental Appropriations Act, 1984
PL 100-676 - Water Resources Development Act of 1988
PL 101-229 - Everglades National Park Protection and Expansion Act of 1989
PL 102-580 - Water Resources Development Act of 1992 modifications to the project.
PL 104-303 – Water Resources Development Act of 1996.
Table 1-1 summarizes the project authorizations and the project purposes added or modified by these authorizations.

1.7.2 Other Studies

There are a number of ongoing studies being conducted by the Corps and other agencies that may contribute to restoration of the south Florida ecosystem. Some of the major efforts are discussed in this section.

The Corps is currently conducting a feasibility study of Biscayne Bay in order to investigate effects on water circulation, biological communities, and water quality of dredging and filling, spoil islands, and freshwater inputs in northern Biscayne Bay from existing Federal canals. The study would propose solutions to alleviate adverse factors affecting the bay and help to develop guidelines for future management of Biscayne Bay's natural resources. The non-Federal sponsor is Miami-Dade County.

The South Florida Ecosystem Restoration Task Force observed that the restoration effort needed to be founded on scientific information and mandated that it take an ecosystem approach. In support of this effort, the Science Sub-Group completed a report in 1996 entitled South Florida Ecosystem Restoration Scientific Information Needs (Science Subgroup, 1996), which provides information in support of the ecosystem approach. It was the first step in the development of an ecosystem-based South Florida Comprehensive Science Plan that includes monitoring and modeling. The Science Coordination Team (formerly the Science Sub-group) is in the process of developing a science plan to supply the information needs for ecosystem restoration.

The science plan developed by the Florida Bay Interagency Working Group, initiated by Everglades National Park in January 1993, focused upon the research, monitoring, and modeling objectives that must be addressed to guide the restoration of Florida Bay. It represents a synthesis of research plans prepared over past years by several Federal and state agencies. This science plan will serve as the basis for restoration of the Florida Bay portions of Sub-regions 3 and 6 under the aegis of the South Florida Ecosystem Restoration Task Force.

The South Florida Water Management District has undertaken the development of regional and sub-regional level water supply plans to provide for better management of south Florida's water resources. The Lower West Coast Water Supply Plan was completed in February 1994 (SFWMD, 1994b). The Interim Plan for Lower East Coast Regional Water Supply (SFWMD, 1998d), which addresses water-related needs and concerns of southeastern Florida through the year 2010, and the Upper East Coast Water Supply Plan (SFWMD, 1998b), which evaluates future 2020 water demands and supplies for the Upper East Coast of Florida were completed in 1998. A Lower East Coast Plan with a 2010 horizon will be developed by April 2000.